REMARKS

In the Office Action, the Examiner rejected claims 1-4, 6-8, 10-16, and 18-26.
The Examiner also objected to claim 18 in view of certain informalities. By the present
Response, Applicants have amended claims 1, 8, 11, 14, 16, 19, and 22-26, canceled
claims 3, 6, 7, 10, 15, 18, and 21, and added new claims 27-34. Applicants respectfully
submit that these amendments do not add any new matter and are fully supported by the
specification. Claims 5, 9, and 17, which were canceled in the previous Response filed
on December 3, 2007, remain canceled. Upon entry of these amendments, claims 1, 2, 4,
8, 11-14, 16, 19, 20, and 22-34 will be pending in the present patent application and are
believed to be in condition for allowance. In view of the foregoing amendments and the
following remarks, Applicants respectfully request reconsideration and allowance of all
pending claims.

Claim Objections

Claim 18 was objected to by the Examiner in view of certain informalities.
Specifically, the Examiner objected to claim 18 as being dependent on itself. *See* Office
Action, page 2. However, because claim 18 has been canceled by the present Response,
Applicants believe the Examiner's objection is now moot. As such, Applicants respectfully
request withdrawal of the objection to claim 18.

Claim Rejections under 35 U.S.C. § 103

In the Office Action, the Examiner rejected claims 1-3, 6-7, 23, and 25 under 35
U.S.C. § 103(a) as being unpatentable over Krantz, U.S. Patent No. 6,248,988
(hereinafter "the Krantz reference") in view of Avinash, U.S. Patent No. 5,943,433
(hereinafter "the Avinash reference") and Lohmeyer et al., U.S. Patent No. 6,061,477
(hereinafter "the Lohmeyer reference"); rejected claim 4 under 35 U.S.C. § 103(a) as
being unpatentable over the Krantz, Avinash, and Lohmeyer references, and further in
view of Finger et al., U.S. Patent No. 6,015,385 (hereinafter "the Finger reference");
rejected claims 8, 13-14, 16, 24, and 26 under 35 U.S.C. § 103(a) as being unpatentable

over the Krantz reference in view of the Avinash reference; rejected claims 10 and 18 under 35 U.S.C. § 103(a) as being unpatentable over the Krantz and Avinash references, and further in view of the Lohmeyer reference; rejected claim 15 under 35 U.S.C. § 103(a) as being unpatentable over the Krantz and Avinash references, and further in view of the Finger reference; rejected claims 11-12 and 19-20 under 35 U.S.C. § 103(a) as being unpatentable over the Krantz and Avinash references and further in view of Blackham et al., U.S. Patent Application Pub. No. 2002/0130875 (hereinafter "the Blackham reference"); and rejected claims 21 and 22 under 35 U.S.C. § 103(a) as being unpatentable over the Krantz and Avinash references and further in view of Delestienne et al., U.S. Patent No. 6,377,162 (hereinafter "the Delestienne reference"). Applicants respectfully traverse these rejections.

Legal Precedent and Guidelines

The burden of establishing a *prima facie* case of obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (PTO Bd. App. 1979). Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention absent some teaching or suggestion supporting the combination. *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 732 F.2d 1572, 1577, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984). Accordingly, to establish a *prima facie* case, the Examiner must not only show that the combination includes *all* of the claimed elements, but also a convincing line of reason as to why one of ordinary skill in the art would have found the claimed invention to have been obvious in light of the teachings of the references. *Ex parte Clapp*, 227 U.S.P.Q. 972 (B.P.A.I. 1985). When prior art references require a selected combination to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gained from the invention itself, i.e., something in the prior art as a whole must suggest the desirability, and thus the obviousness, of making the combination. *Uniroyal Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 5 U.S.P.Q.2d 1434 (Fed. Cir. 1988). One cannot use hindsight reconstruction to

pick and choose among isolated disclosures in the prior art to deprecate the claimed invention. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988).

Moreover, it is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743, 218 U.S.P.Q. 769, 779 (Fed. Cir. 1983); M.P.E.P. § 2145. That is, if the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 U.S.P.Q. 349 (CCPA 1959); *see* M.P.E.P. § 2143.01(VI). If the proposed modification or combination would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984); *see* M.P.E.P. § 2143.01(V).

Independent Claims 1, 23, and 25

Independent claim 1, as amended, recites a method comprising, *inter alia*, "determining a desired sampling rate … based at least partially on a point-spread function of the imaging system *or* the frequency content of the image data." (Emphasis added). This feature is also recited in amended independent claims 23 and 25, which are directed towards a system and a computer readable medium comprising encoded routines, respectively. In the present Office Action, the Examiner rejected claims 1, 23, and 25, citing the combination of the Krantz, Avinash, and Lohmeyer references. However, contrary to the Examiner's assertions, Applicants do not believe any of the cited references, either alone or in combination, teaches, discloses or even hints at this recited feature.

As an initial matter, Applicants note that this subject matter was previously recited by dependent claim 3, which depends from claim 1. In the Office Action, the Examiner rejected dependent claim 3 in view of the combined teachings of the Krantz,

Avinash, and Lohmeyer references, alleging specifically that the Krantz reference teaches the determination of a desired sampling rate either based on a point-spread function of an imaging system or based on the frequency content of image data. *See* Office Action, page 5. To support the foregoing assertion, the Examiner cited to the following passage of the Krantz reference:

> With reference to FIG. 15, the present invention functions as a highly efficient confocal imaging system if array detectors with active areas smaller than the main lobe of the point spread function are used. Conversion between conventional and confocal imaging is accomplished by exchanging array detectors 244, 252, 258 with others 244', 252', 258' having different active area size or by inserting a pinhole array in front of conventional (large active area) detectors.
>
> Krantz, col. 13, lines. 30-37.

However, after carefully reviewing the subject matter disclosed in the Krantz reference, Applicants are unable to identify any teaching in the cited paragraph or elsewhere, which appears to even remotely suggest using a point-spread function of an imaging system or the frequency content of image data to determine a *desired sampling rate*. Instead, Applicants note that the passage relied upon by the Examiner appears to merely suggest that the efficiency of an imaging system may be improved by employing certain array detector elements which have active areas less than the main lobe of the point-spread function of the imaging system. For instance, the cited passage appears to indicate that the size of the active areas of detector elements may be adjusted to either increase or decrease an imaging system's efficiency by inserting pinhole arrays in front of the array detectors. To the extent that a point-spread function does appear to be discussed, Applicants assert that there is absolutely no indication that the point-spread function is disclosed as being used to determine any type of sampling rate, much less a desired sampling rate. Alternatively, Applicants can find no language in the Krantz

reference teaching or suggesting that a desired sampling rate may also be determined from the frequency content of image data, nor has the Examiner indicated that such a teaching is present in the Krantz reference. Indeed, it appears the Examiner has relied *solely* on the mistaken assumption that the Krantz reference allegedly discloses using a point spread function to determine a desired sampling rate.

As such, Applicants submit that the Krantz reference fails to teach, suggest, or even hint at the use of (1) a point-spread function of an imaging system or (2) the frequency content of an image for determining a *desired sampling rate*. Moreover, Applicants note that the Avinash and Lohmeyer references, which the Examiner cited in combination with the Krantz reference, do not appear to remedy the above-discussed deficiencies. Indeed, the Examiner has not indicated that either the Avinash or Lohmeyer references are relied upon in this manner. Thus, Applicants submit that no possible combination of the cited references could be construed as teaching, suggesting, or even hinting at the determination of a *desired sampling rate* based upon a point-spread function or based upon frequency content of image data.

In view of the foregoing discussion, Applicants respectfully submit that the subject matter previously recited by dependent claim 3, which has been canceled by the present Response, would have been allowable over these cited references. Further, because independent claims 1, 23, and 25 have each been amended, as noted above, to incorporate the subject matter previously recited by the canceled dependent claim 3, Applicants submit that each of these independent claims are presently allowable over the Krantz, Avinash, and Lohmeyer references for at least the reasons discussed above. As such, Applicants respectfully request withdrawal of the Section 103 rejections and allowance of independent claims 1, 23, and 25, as well as those claims depending therefrom.

Independent Claims 8, 16, 24, and 26

Independent claim 8, as amended, recites a method comprising, *inter alia*, "accessing stored image data ... previously acquired by an imaging system using a *first pixel sampling rate*," "determining a *second pixel sampling rate*" that is a "*desired sampling rate*," "calculating a shrink parameter as a *ratio* of the first pixel sampling rate to the desired sampling rate," and "shrinking the input image ... based at least partially on the shrink parameter *if the shrink parameter is greater than one*." (Emphasis added). In other words, the method recited by independent claim 8 requires not only that the shrinking of an input image is performed conditionally when the calculated shrink parameter (the ratio of the first pixel sampling rate to the second/desired sampling rate) is greater than one, but that the calculated shrink parameter is based on a ratio of the first pixel sampling rate at which an imaging system initially acquired the image data to the desired (second) sampling rate. Amended independent claims 16 and 24 recite similar subject matter and are generally directed towards systems adapted to perform the method of independent claim 8. Amended independent claim 26 also recites similar subject matter and is directed towards a computer readable medium storing encoded routines for carrying out the method of independent claim 8.

In rejecting independent claims 8, 16, 24, and 26, the Examiner cited the combination of the Krantz and Avinash references. Contrary to the Examiner's assertions, however, Applicants do not believe that either of the cited references, either alone or in combination, discloses each any every element set forth in independent claims 8, 16, 24, or 26. Specifically, Applicants submit that the Krantz and Avinash reference fail to teach or suggest calculating a shrink parameter as a ratio of the first pixel sampling rate to the desired sampling rate and also shrinking the input image based at least partially on the shrink parameter if the shrink parameter is greater than one. Indeed, Applicants note that the Examiner has even acknowledged in the present Office Action that the Krantz reference fails to disclose determining a shrink parameter as a ratio of a pixel sampling rate to a desired sampling rate. *See* Office Action, page 3 (noting the Examiner's comments

regarding the deficiencies of the Krantz reference in the rejection of claim 1). Further, while the Avinash reference does disclose the use of a shrink parameter, Applicants note that the shrink parameter disclosed by the Avinash reference does not appear to be based on a ratio of *sampling rates*, as would be required to anticipate claims 8, 16, 24, and 26.

In contrast, the Avinash reference appears to disclose that a shrink parameter is calculated simply based on an actual *pixel size* of an image compared to a desired *pixel size* of a resulting shrunken image. For instance, the Avinash reference discloses that to shrink an image having dimensions of 256x256 pixels to an image having dimensions of 32x32 pixels, a shrink parameter is calculated for each edge of the image (*e.g.*, X-axis and Y-axis edges) by dividing the actual pixel dimension by the pixel dimension desired in the resulting shrunken image. *See* Avinash, col. 5, lines 20-27. In the presently provided example, the shrink parameter is calculated as 256/32, providing a shrink parameter value of 8. However, as one skilled in the art will appreciate, the physical size of an image is not analogous to the sampling rate of an image. Indeed, Applicants note that the present application, in the passage quoted below, emphasizes the foregoing distinction and drawbacks regarding shrinking operations based on image sizes as opposed to those based on sampling rates and/or spatial resolutions:

> *Previous techniques have, however, relied upon the image size to determine the degree of shrinking or sub-sampling.* The present technique employs a more rigorous approach in which the amount of sub-sampling done to shrink the input image depends upon the intrinsic spatial resolution of the image. In the present context, it may be considered that the inherent spatial resolution may depend on the point-spread function of the imaging system acquiring the image data and the sampling rate used to generate the discrete image. As described below, such information is used to determine the optimal sampling rate, which may be defined as the Nyquist rate of the imaging system. This value is used to determine the amount of sub-sampling or shrinking that is to be performed on the image prior to applying the spatial domain

operations. The approach ensures that the optimal sampling criteria are not violated by under-sampling and that the maximum amount of sampling can be attained without loss of image information to perform filtering on the image with normalized resolution and to exploit redundancies in the image data.

Specification, page 6, lines 12-26 (emphasis added).

As the Examiner will appreciate, shrinking an image based *solely* on image size without accounting for the image sampling rate of the image would fail to take into account whether the resulting image will be under-sampled (*e.g.*, loss of data). Therefore, Applicants submit that the shrink parameter disclosed in the Avinash reference, which is based on a ratio of image pixel dimensions, is not analogous to the recited shrink parameter of the presently pending claims, which is clearly set forth as being a ratio of *sampling rates*. Further, because the Krantz and the Avinash references, alone or in combination, fail to teach a shrink parameter calculated as a ratio of *sampling rates*, neither of these cited references can possibly be construed as disclosing that a shrink operation is performed *if* such a shrink parameter, calculated based on a ratio of sampling rates, is greater than one.

Accordingly, for at least the reasons discussed above, Applicants submit that amended independent claims 8, 16, 24, and 26 are presently in condition for allowance. As such, Applicants respectfully request withdrawal of the Section 103 rejections and allowance of independent claims 8, 16, 24, and 26, as well as those claims depending therefrom.

Dependent Claim 14

Claim 14 depends from claim 8 and recites "wherein the desired sampling rate is determined based at least partially on a point-spread function of the imaging system, or the frequency content of the image data." In the present Office Action, the Examiner also rejected claim 14 in view of the combined teachings of the Krantz and Avinash

references. Applicants note, however, that the subject matter recited by claim 14 is similar to the subject matter previously recited by canceled dependent claim 3, which is believed to be allowable over the Krantz, Avinash, and Lohmeyer references for at least the reasons discussed above with regard to independent claims 1, 23, and 25. Accordingly, Applicants submit that dependent claim 14 is allowable not only by virtue of its dependency from claim 8, but also for the subject matter additionally recited therein.

Remaining Dependent Claims

As stated above, the Examiner rejected dependent claims 4, 11-12, 15, and 19-22 in view of the above-discussed combination of the Krantz and Avinash and/or Lohmeyer references, and further in view of one or more of the additionally cited Blackham, Finger, or Delestienne references. Applicants note, however, that each of these rejected claims depends from a parent claim believed to be allowable over the Krantz, Avinash, and Lohmeyer references for at least the reasons discussed above. Further, Applicants submit that none of the additionally cited references obviates the deficiencies of the Krantz, Avinash, and Lohmeyer references. As such, rejected dependent claims 4, 11-12, 15, and 19-22 are believed to be allowable at least by virtue of dependency from an allowable parent claim. Accordingly, withdrawal of the Section 103 rejections and allowance of claims 4, 11-12, 15, and 19-22 are respectfully requested.

Newly Added Claims

As set forth in the above-submitted amendments, Applicants have added new claims 27-34 by the present Response. Specifically, Applicants have added: new claims 27-29, which depend from claim 1, either directly or through intervening claims; new claims 30-31, which depend directly from claim 8; and new claims 32-34, which depend directly from claim 16. As such, Applicants submit that all the newly added claims are allowable at least by virtue of dependency from an allowable base claim, in addition to the subject matter separately recited by these dependent claims.

For example, claim 34 recites "wherein the desired sampling rate is determined based at least partially on a point-spread function of the imaging system, or the frequency content of the image data." As discussed above, this subject matter is similar to the subject matter previously recited by dependent claim 3, which has been canceled by the present Response and incorporated into independent claims 1, 23, and 25. Further, this subject matter is believed to be allowable over the Krantz, Avinash, and Lohmeyer references for at least the reasons discussed above with regard to independent claims 1, 23, and 25. Accordingly, Applicants submit that at least dependent claim 34 is allowable not only by virtue of its dependency from independent claim 16, but also for the subject matter additionally recited therein.

Improper Combination of References: Krantz teaches away from Avinash and Lohmeyer

As stated above, the Examiner, in rejecting the presently pending claims, acknowledged that the Krantz reference fails to disclose (1) determining a shrink parameter and shrinking an image based upon the shrink parameter, and (2) determining a shrink parameter as a ratio of an actual pixel sampling rate to a desired sampling rate. See Office Action, page 3. Moreover, to remedy the admitted deficiencies of the Krantz reference, the Examiner has further relied on the Avinash and Lohmeyer references. Although Applicants believe that the Examiner's asserted combination of the Krantz reference with either of the Avinash or Lohmeyer references fails to render the pending claims obvious for at least the reasons set forth above, Applicants further stress that the Krantz reference actually *teaches away* from the Avinash and the Lohmeyer references and, therefore, the references are not properly combinable. *See In re Grasselli*, 713 F.2d 731 at 743.

For instance, in the present Office Action, the Examiner alleged that the Krantz reference teaches "comparing the pixel sampling rate to a desired sampling rate (column 3, line 25-26), (the desired sampling rate is read as Nyquist's theorem)." Office Action, page 3. The specific passage of the Krantz reference relied upon by the Examiner states:

> However, for imaging purposes this approach is limited by
> the optical performance of the microlens array, in particular
> the numerical aperture (NA)--aberration tradeoff preventing
> small spot sizes for high resolution, the limited working
> distance at large NA, and *insufficient sample compared to
> Nyquist's theorem.*
>
> Krantz, col. 3, lines 20-26 (emphasis added).

In other words, it appears that the Krantz reference, at best, discloses an image having <u>an</u> <u>actual sampling rate that is less than a desired sampling rate</u>, which the Examiner has correlated to the Nyquist sampling rate, in accordance with Nyquist's theorem. However, as one skilled in the art will readily appreciate, when the sampling rate of an image is *less* than an optimal sampling rate, such as the Nyquist sampling rate, it *would not* be desirable to shrink the image. For instance, the application of a shrinking operation to an image that is *already* under-sampled (*e.g.*, sampled at less than the Nyquist rate) may result in loss of image data in the resulting shrunken image.

With the foregoing in mind, Applicants remind the Examiner that if the proposed modification or combination would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984); *see* M.P.E.P. § 2143.01(V). Accordingly, even if the Krantz reference was hypothetically modified to further include the shrinking operations disclosed in the Avinash and Lohmeyer references, Applicants submit that the resulting shrunken images of Krantz would be under-sampled and <u>would not be suitable or satisfactory</u> for use in the imaging acquisition system disclosed by the Krantz reference. Therefore, Applicants submit that, contrary to the Examiner's assertions, it *would not* be obvious to one skilled in the art to combine the teachings of the Krantz reference with image shrinking techniques disclosed by the Avinash and Lohmeyer references.

Thus, for at least these reasons, Applicants submit that the Krantz reference, which discloses an image having a sampling rate that is *less* than the Nyquist rate (desired sampling rate), teaches away from the image shrinking techniques disclosed by the Avinash and Lohmeyer references, which the Examiner has specifically relied upon to remedy the deficiencies of the Krantz reference. Therefore, although Applicants believe that the cited references fail to render obvious the pending claims for at least the reasons discussed above, Applicants further emphasize that the Examiner's proposed combination of the Krantz reference with either of the Avinash or Lohmeyer references is improper and must be withdrawn.

Conclusion

In view of the amendments set forth above, Applicants respectfully submit that all pending claims are now in condition for allowance. If the Examiner believes that a telephonic interview will help speed this application toward issuance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

Date: April 22, 2008

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